Amendments to the Claims:

Following is a listing of all claims in the present application, which listing supersedes all previously presented claims:

Listing of Claims:

1. (Currently Amended) A wireless communication system including a plurality of transmitting antennas and a plurality of receiving antennas through which signals are transmitted and received, the wireless communication system comprising:

a transmitter that restores a first feedback information from a predetermined feedback signal, weights an information signal with the ~~restored~~ first feedback information, and converts the weighted information signal to a first radio frequency signal in order to transmit the first radio frequency signal; and

a receiver that receives the first radio frequency signal to estimate [[the]] a state of a channel through which the first radio frequency signal is transmitted, calculates a first weight of a first dimensionality corresponding to [[the]] a number of the plurality of transmitting antennas from the estimated channel state, approximates the first weight to a second weight having a second dimensionality, the second dimensionality being lower than the first dimensionality, ~~as lower-dimensional one~~ to extract a second feedback information, and converts the second feedback information into a second radio frequency signal to send the second radio frequency signal to the transmitter.

2. (Currently Amended) The wireless communication system [[of]] as claimed in claim 1, wherein the receiver comprises:

a baseband processor that extracts a baseband signal from the first radio frequency signal and estimates the channel state;

a feedback information approximation unit that calculates the first weight of the first dimensionality ~~a dimensionality corresponding to the number of the transmitting antennas~~, which maximizes a predetermined objective function, and approximates the first weight to the second weight ~~as lower-dimensional one~~ to extract the second feedback information; and

a feedback unit that sends the second feedback information back to the transmitter.

3. (Currently Amended) The wireless communication system [[of]] as claimed in claim 2, wherein the predetermined objective function is $P=\mathbf{W}^H\mathbf{H}^H\mathbf{H}\mathbf{W}$, where a matrix $\mathbf{H}$ denotes the channel state, a vector $\mathbf{W}$ denotes the first weight, and the superscript H denotes a Hermitian operator, the feedback information approximation unit calculates an optimum first weight $\mathbf{W}_{opt}$ that maximizes the predetermined objective function and approximates the optimum first weight $\mathbf{W}_{opt}$ to an optimum second weight ~~a lower dimension~~ constituted by a predetermined basis vectors to extract the feedback information.

4. (Currently Amended) The wireless communication system [[of]] as claimed in claim 3, wherein $\mathbf{W}_{opt}$ is an eigenvector corresponding to a maximum eigenvalue of $\mathbf{H}^H\mathbf{H}$ in the predetermined objective function.

5. (Currently Amended) The wireless communication system [[of]] as claimed in claim 1, wherein the transmitter comprises:

a feedback information restoring unit that restores the first feedback information from the second radio frequency signal received from the receiver;

a baseband processor that encodes and modulates [[an]] the information signal;

a weighting unit that multiplies the ~~restored~~ first feedback information by an output signal of the baseband processor; and

a radio frequency processor that converts an output signal of the weighting unit to [[a]] the first radio frequency signal to output the first radio frequency signal.

6. (Currently Amended) A wireless communication system including a plurality of transmitting antennas and a plurality of receiving antennas through which signals are transmitted and received, respectively, the wireless communication system comprising:

a transmitter that restores a first feedback information from a predetermined feedback signal, weights an information signal with the ~~restored~~ first feedback information, and

converts the weighted information signal into a first radio frequency signal in order to transmit the first radio frequency signal; and

a receiver that receives the first radio frequency signal to estimate the state of a channel through which the first radio frequency signal is transmitted, selects a number of basis vectors and their coefficients corresponding to [[the]] a dimensionality of approximation among the basis vectors whose number corresponds to [[the]] a number of the plurality of transmitting antennas, obtains a plurality of weights from the selected basis vectors and coefficients, extracts a weight that maximizes a predetermined objective function obtained from the estimated channel state among the plurality of weights as a second feedback information, and converts the second feedback information into a second radio frequency signal in order to send the second radio frequency signal to the transmitter as the predetermined feedback signal.

7. (Currently Amended) The wireless communication system [[of]] as claimed in claim 6, wherein the receiver comprises:

a baseband processor that extracts a baseband signal from the first radio frequency signal and estimates the channel state;

a feedback information approximation unit that selects [[a]] the number of basis vectors and their coefficients corresponding to the dimensionality of approximation among the basis vectors whose number corresponds to the number of the transmitting antennas, obtains [[a]] the plurality of weights from the selected basis vectors and coefficients, extracts [[a]] the weight that maximizes [[a]] the predetermined objective function obtained from the channel state among the plurality of weights as the second feedback information; and

a feedback unit that sends the second feedback information back to the transmitter.

8. (Currently Amended) The wireless communication system [[of]] as claimed in claim 7, wherein [[an]] the predetermined objective function is $P_i = W_i^H \mathbf{H}^H \mathbf{H} W_i$, where a matrix $\mathbf{H}$ denotes the channel state, a vector W_i is a weight calculated from i-th selected basis vector and coefficient, and the superscript H is a Hermitian operator, the feedback

information approximation unit extracts the weight W_i that maximizes the predetermined objective function as the second feedback information.

9. (Currently Amended) A wireless communication method in which, when M radio frequency signals transmitted from a transmitter are received through multiple paths, a feedback information is extracted from [[the]] received signals and the extracted feedback information is sent to the transmitter, the method comprising the steps of:

(a) estimating states of channels ~~comprising~~ of the multiple paths from the received signals;

(b) calculating a weight, which is fed back into the transmitter and multiplied by the M radio frequency signals, from the estimated channel state;

(c) approximating the weight [[as]] to a weight of dimension S which is less than M and quantizing coefficients for the approximated dimension; and

(d) feeding the basis vectors and their quantized coefficients, ~~of the approximated dimension,~~ or indices that identify the basis vectors and their quantized coefficients, of the approximated dimension back to the transmitter.

10. (Currently Amended) The method [[of]] as claimed in claim 9, wherein, in the step (b), when the number of multiple paths is L, $\mathbf{W}_{opt}$ that maximizes [[an]] a predetermined objective function expressed by $P=\mathbf{W}^H\mathbf{H}^H\mathbf{H}\mathbf{W}$ is extracted as the feedback information, where a matrix **H** having a size of L x M denotes the channel state, a vector **W** having magnitude of M denotes the weight, and the superscript H denotes a Hermitian operator.

11. (Currently Amended) The method [[of]] as claimed in claim 10, wherein the step (c) comprises the steps of:

(c1) determining the basis vectors that represent the M dimensions;

(c2) calculating the coefficients corresponding to the basis vectors from the inner product of the $\mathbf{W}_{opt}$ and each basis vector;

(c3) selecting S coefficients among the coefficients calculated in the step (c2) in order of magnitude and selecting the basis vectors corresponding to the selected S coefficients; and

(c4) quantizing the selected coefficients.

12. (Currently Amended) The method [[of]] as claimed in claim 9, [[if]] when the feedback signal includes the basis vectors and the ~~quantization~~ quantized coefficients in the step (d), further comprising the steps of:

(e) extracting the basis vectors and the ~~quantization~~ quantized coefficients from the feedback ~~signal~~ information received from the transmitter;

(f) restoring feedback information from the extracted basis vectors and the ~~quantization~~ quantized coefficients;

(g) weighting an information signal to be transmitted with the restored feedback information; and

(h) transmitting the weighted information signal.

13. (Currently Amended) The method [[of]] as claimed in claim 9, [[if]] when the feedback information includes the indices in the step (d), further comprising the steps of:

(e) storing the [[base]] basis vectors and the ~~quantization~~ quantized coefficients of S dimensions and indices identifying the basis vectors and the ~~quantization~~ quantized coefficients, respectively, in the transmitter;

(f) extracting the indices from a received feedback signal and basis vectors and ~~quantization~~ quantized coefficients identified by the indices among the [[base]] basis vectors and the ~~quantization~~ quantized coefficients stored in the step (e);

(g) restoring the feedback information from the extracted basis vectors and the ~~quantization~~ quantized coefficients;

(h) weighting an information signal to be transmitted with the restored feedback information; and

(i) transmitting the weighted information signal.

14. (Currently Amended) A wireless communication method in which, when M radio frequency signals transmitted from a transmitter are received through multiple paths, a feedback information is extracted from [[the]] received signals and the extracted feedback information is sent to the transmitter, the method comprising the steps of:

(a) estimating states of channels comprising the multiple paths from the received signals;

(b) determining basis vectors that represent M dimensions;

(c) selecting S basis vectors among the determined basis vectors, where S is less than M;

(d) selecting one of N quantization coefficients for each basis vector;

(e) obtaining feedback information W_i from the selected basis vectors and quantization coefficients; and

(f) sending W_i or an index indicating W_i back to the transmitter [[if]] when a predetermined objective function P_i generated from W_i and the estimated channel **H** reaches a maximum.

15. (Currently Amended) The method [[of]] as claimed in claim 14, wherein the predetermined objective function P_i is expressed by $P_i = W_i^H \mathbf{H}^H \mathbf{H} W_i$ where the superscript H is a Hermitian operator.

16. (Currently Amended) The method [[of]] as claimed in claim 14, wherein, [[if]] when the predetermined objective function P_i does not reach a maximum, the steps (e) and (f) are repeated for ${}_M C_S$ cases in which another S basis vectors are selected from the M basis vectors and for N^S cases in which another quantization coefficient is selected for each of the selected S basis vectors.

17. (Currently Amended) The method [[of]] as claimed in claim 14, [[if]] when the extracted feedback information includes W_i in the step (f), further comprising the steps of:

(g) extracting W_i from [[a]] the received feedback signal;

(h) weighting [[an]] the information signal to be transmitted with the extracted W_i ; and

(i) transmitting the weighted information signal.

18. (Currently Amended) The method [[of]] as claimed in claim 14, [[if]] when the feedback information includes the index in the step (f), further comprising the steps of:

(g) storing selectable W_i and index indicating W_i in the transmitter;

(h) extracting the index from a received feedback signal and W_i identified by the index;

(i) weighting an information signal to be transmitted with the extracted W_i; and

(j) transmitting the weighted information signal.

19. (Currently Amended) The wireless communication system [[of]] as claimed in claim 5, wherein the predetermined objective function is $P=\mathbf{W}^H\mathbf{H}^H\mathbf{H}\mathbf{W}$, where a matrix **H** denotes the channel state, a vector **W** denotes the first weight, and the superscript H denotes a Hermitian operator, the feedback information ~~approximation~~ restoring unit calculates an optimum first weight $\mathbf{W}_{opt}$ that maximizes the predetermined objective function and approximates the optimum first weight $\mathbf{W}_{opt}$ to an optimum second weight ~~a lower dimension~~ constituted by a predetermined basis vectors to extract the feedback information.

20. (Currently Amended) The wireless communication system [[of]] as claimed in claim 5, wherein $\mathbf{W}_{opt}$ is an eigenvector corresponding to a maximum eigenvalue of $\mathbf{H}^H\mathbf{H}$ in the predetermined objective function.